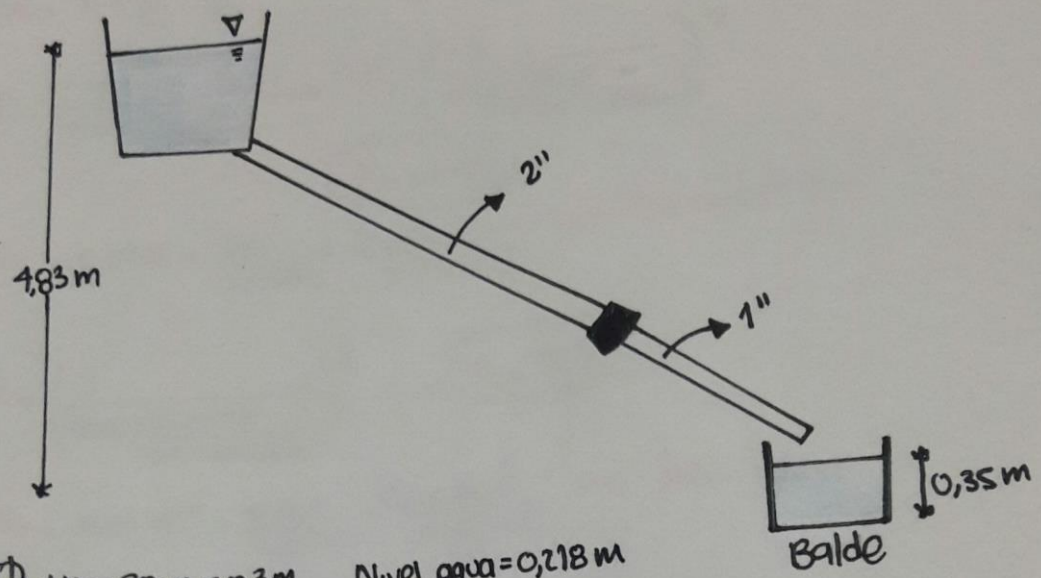
Ejercicio Propuesto.



$\Phi_{balde} = 30cm = 0,3m$ Nivel agua = 0,218 m

$$Q = \frac{V}{t} = \frac{A * l}{t} = \frac{\pi/4\,(0,3m)^2 * 0,218m}{7,46\ seg}$$

$$Q = 2,066 \cdot 10^{-3}\ \frac{m^3}{s}$$

Ecuación de continuidad

$$Q = V_1 A_1 = V_2 A_2$$

$\Phi_1 = 1 pulg = 0,0254m$

$\Phi_2 = 2 pulg = 0,0508m$

$$V_1 = \frac{Q}{A_1} = \frac{2,066 \cdot 10^{-3}\ m^3/s}{(0,0254m)^2\ \pi/4} \rightarrow V_1 = 4,08\ m/s$$

$$V_2 = \frac{Q}{A_2} = \frac{2,066 \cdot 10^{-3}\ m^3/s}{(0,0508m)^2\ \pi/4} \rightarrow V_2 = 1,02\ m/s$$

Pérdidas de carga continuas

$h_{r1} = F * \frac{L}{D} * \frac{V^2}{2g}$

$\varepsilon_{PVC} = 1,5 \cdot 10^{-6} m$

$F = \left(\frac{1}{-2 \log \left(\frac{\varepsilon}{3,71 \cdot \phi} \right)} \right)^2 \rightarrow F = \left(\frac{1}{-2 \log \left(\frac{1,5 \cdot 10^{-6} m}{3,71 * 0,0254 m} \right)} \right)^2$

$F = 0,0108$

$h_{r1} = 0,0108 * \frac{2m}{0,0254 m} * \frac{(4,08 m/s)^2}{2(9,81 m/s^2)} \rightarrow h_{r1} = 0,7215 m$

$F_2 = \left(\frac{1}{-2 \log \left(\frac{1,5 \cdot 10^{-6} m}{3,71 * 0,0508 m} \right)} \right)^2 \rightarrow F_2 = 9,61 \cdot 10^{-3}$

$h_{r2} = 9,61 \cdot 10^{-3} * \frac{8,46 m}{0,0508 m} * \frac{(1,02 m/s)^2}{2(9,81 m/s^2)} \rightarrow h_{r2} = 0,85 m$

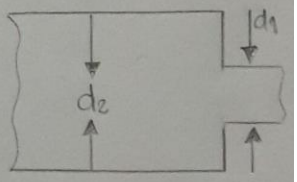
Pérdida de carga en una contracción brusca.

$K = 0,5 \left(1 - \frac{d_1^2}{d_2^2} \right)$ $\quad K = 0,5 \left(1 - \frac{(0,0254 m)^2}{(0,0508 m)^2} \right)$

$K = 0,38$

$H_{contracción} = \frac{K V^2}{2g} \rightarrow H_{contr} = 0,38 * \frac{(4,08 m/s)^2}{2(9,8 m/s^2)}$

$H_{contr} = 0,32.$



Pérdidas por accesorios.

$h_L = K * \frac{V^2}{2g}$ $\quad K = \frac{le}{D} * F$

Codo 1 roscado (90°) con $\phi = 2''$

$F_t = 0,019$ $\quad le/D = 50$ $\quad K = 50 * 0,019 \Rightarrow K = 0,95$

Válvula de globo 2"

$\frac{le}{D} = 340$ $\quad f_t = 0,019.$ $\quad K = 340 * 0,019 = 6,46.$

$\Sigma K = 0,95 + 6,46 = 7,41$

$h_L = 7,41 \left(\frac{(4,08\ m/s)^2}{2(9,81\ m/s^2)} \right) \rightarrow h_L = 6,29\ m$

$h_T = \frac{V^2}{2g} \left(f \frac{L}{D} + \Sigma K \right)$

$h_T = 0,7215m + 0,085m + 0,32m + 6,29m$

$h_T = 7,4215\ m$

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